

**Appl. No.** : **10/030,732**  
**Filed** : **January 8, 2002**

### **REMARKS**

Claim 1 has been amended to clarify the invention. Support for the amendments to Claim 1 can be found in Figs. 4-7 and 18-20, for example. Claim 2 has been amended to correct minor informalities. Claims 11-14 have been added. Support for Claims 11 and 13 can be found on page 11, lines 10-12 of the specification, for example. Support for Claim 12 can be found in Claim 1 as originally filed and Figs. 4-7 and 18-20, for example. Accordingly, Claims 1, 2, 8 and 10-14 are pending in this application. The amendments do not raise the addition of new matter to the application. Applicant respectfully requests entry of the amendments and reconsideration of the application in view of the amendments and the following remarks.

#### **Drawings Objection**

The drawings are objected to because reference characters “2” and “22” have been used to designate both a “molten metal cooling and solidifying section” and a “molten metal holding section” on pages 18 and 22. The specification has been amended so that reference character “2” is used to designate a “molten metal cooling and solidifying section” and reference character “22” is used to designate a “molten metal holding section”. It is respectfully requested that the objection be withdrawn.

#### **Specification Objection**

The abstract of the disclosure is objected to because of including the improper language and formats. The abstract has been amended to correct the informalities, thereby obviating the objection.

The disclosure is objected to because the old claim language remains on page 2, line 15 through page 4, line 11. The claim language has been amended to comply with the U.S. practice.

The Examiner points out that “tabular” on page 24, line 17 should be changed to “tubular”. Contrary to the Examiner’s assertion, “tabular” is correct term. The meaning of “tabular” is similar to “plate-shaped”. It is respectfully requested that the objection be withdrawn.

#### **Claim Objection**

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Claim 2 is objected to because of the term "aluminium". Claim 2 has been amended to correct the informalities, thereby obviating the objection. It is respectfully requested that the objection be withdrawn.

Rejection of Claims 1, 2 and 8 Under 35 U.S.C. § 103

Claims 1, 2 and 8 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Shapovalov (US 5,181,549) in view of JP 5-59462. Claim 1 has been amended for clarification. Claim 1 is independent and Claims 2 and 8 are dependent on Claim 1. The claims as amended herein could not be obvious over the references as explained below.

Shapovalov discloses a process for producing a porous metal body by dissolving gas in a molten raw metal material under pressurization, and then cooling and solidifying the molten metal under the condition of controlling the temperature and pressure. Shapovalov discloses only the case of eutectic like solidification specifically using hydrogen as the dissolving gas (see column 5, lines 6-29, column 5, lines 51-53, and Fig. 9).

Although Shapovalov mentions "a hydrogen-containing mixture" (column 4, lines 30-36), no example of processes using the mixture is disclosed. Further, there is no teaching of specific components for the mixture other than hydrogen.

In contrast, Claim 1 as amended herein recites "introducing a gas containing nitrogen gas and optionally one or more gases selected from the group consisting of hydrogen, argon, and helium into the sealed vessel." Shapovalov teaches specifically hydrogen and does not teach or even suggest nitrogen as a dissolving gas. Nitrogen is not a carrier gas such as argon and helium but a dissolving gas which is dissolved in a porous metal, thereby modifying the characteristics of the porous metal.

Applicant submits herewith a declaration under 37 CFR §1.132. In the declaration, a mixture of hydrogen and nitrogen was used at various mixing ratios. As shown in Fig. 28 (the figure numbers used in the declaration are consecutive from the figure numbers in the application), the nitrogen content in the porous metal increases as the partial pressure of nitrogen increases, indicating that nitrogen was absorbed in the porous metal. Further, surprisingly, the higher the nitrogen content, the higher the ultimate tensile strength and the higher the yield

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strength in porous iron materials became as shown in Fig. 29. It is clear that nitrogen is significantly superior to hydrogen, and the advantages cannot compare.

In view of the foregoing, the use of nitrogen could not be obvious over hydrogen. Shapovalov does not teach or even suggest nitrogen, and JP 5-59462 is irrelevant to dissolving gas in a molten raw metal material. Thus, Claim 1 could not be obvious over the references. At least for the reason above, dependent Claims 2 and 8 also could not be obvious over the references. It is respectfully requested that the rejection be withdrawn.

#### Rejection of Claim 10 Under 35 U.S.C. § 103

Claim 10 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Shapovalov (US 5,181,549) in view of JP 5-59462, and further in view of JP 3-294437.

Claim 10 depends on Claim 1 and recites the above distinct features of Claim 1, and additionally recites a continuous casting method. The Examiner asserts that JP 3-294437 discloses a method and apparatus for manufacturing porous metallic materials, in which the process includes continuously draining slurried porous metal 12 from a drain nozzle 3 to provide continuous casting in the mold below the molten metal 10 in the container, such that the continuously draining/casting of the porous metal is advantageous for continuously obtaining a porous metal product having a wide range of shapes and porosity.

However, although JP 3-294437 discloses a continuous casting method, the other distinct features of Claim 1 are not disclosed or suggested. Thus, a combination of the references still could not lead to the claimed invention. It is respectfully submitted that the rejection should be withdrawn.

#### New Claims 11-14

##### **Claim 11**

Claim 11 has been added to recite a specific gas. Such a gas is not disclosed in the cited references. Therefore, Claim 11 is patentable for this additional reason as well.

##### **Claims 12-14**

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Claim 12 has been added to recite a gas mixture containing nitrogen gas and at least one gas selected from the group consisting of hydrogen, argon, and helium. Such a gas mixture is not disclosed in the cited references. By using the mixed gas, the process of the claimed invention can be carried out not only in an eutectic state, but also in the other states (see page 14, lines 25 through page 16, line 3, and page 29, line 18 through page 30, line 22 of the specification, and Fig. 2). Further, by using the mixed gas, it is possible to control the porosity and pore size and so forth as desired by adjusting the mixing ratio of the gas and the gas pressure (see page 11, lines 10-13, page 12, line 16 through page 13, line 14, and page 16, line 4 through page 17, line 4 of the specification). Furthermore, by using the mixed gas, the porous metal body obtained by the claimed invention has various excellent characteristics such as its strength (see page 13, line 14 through page 14, line 13, and page 17, line 5 through page 18, line 8 of the specification).

In view of the foregoing, one of ordinary skill in the art could not have conceived the invention recited in Claim 12. Claims 13 and 14 as added are dependent on Claim 12. Thus, Claims 13 and 14 are also patentable.

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**CONCLUSION**

In light of the Applicant's amendments to the claims and the foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: November 10, 2004

By:



Katsuhiro Arai  
Registration No. 43,315  
Attorney of Record  
Customer No. 20,995  
(949) 760-0404

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